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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the inverter circuit and compact self-ballasted fluorescent lamp of a complementary.

[0002]

[Description of the Prior Art] Conventionally, the inverter circuit of the half bridge form of the complementary which connected the field-effect transistor of an N channel and the field-effect transistor of a P channel to the serial is known. This inverter circuit mounted the field-effect transistor of the N channel used as two components, and the field-effect transistor of P type by another member, respectively, and has connected separately the gate of the field-effect transistor of an N channel and a P channel to one gate control circuit, respectively.

[0003]

[Problem(s) to be Solved by the Invention] As mentioned above, in spite of connecting the gate of the field-effect transistor of N type and P type to one gate control circuit, leading about of a circuit pattern is needed and it has the problem which improvement in mounting effectiveness cannot plan easily.

[0004] In the case of the compact self-ballasted fluorescent lamp which is spreading especially in recent years, since the component-side product is narrow, it is necessary to mount more efficiently.

[0005] This invention was made in view of the above-mentioned trouble, and aims at offering the inverter circuit and compact self-ballasted fluorescent lamp which improved mounting effectiveness.

[0006]

[Means for Solving the Problem] The field-effect transistor of the pair which was complementary as for the inverter circuit according to claim 1, and was constituted, The terminal connected common to the gate of each field-effect transistor, The terminal to which the drain of each field-effect transistor and either of the sources are connected in common, It reaches. the drain of each field-effect transistor, and either of the sources -- the chip for switching and; which have four terminals of the terminal to which another side is connected separately, respectively in the same package -- the field-effect transistor of this chip for switching Provide the gate control circuit to control, and since it is the field-effect transistor of a complementary Since the gate can be connected in common and either a drain or the source can be connected in common, when it is made the same package, if there are four terminals, connection of each field-effect transistor can be performed, leading about of a circuit can be made brief, and mounting effectiveness improves.

[0007] An inverter circuit according to claim 2 is a surface mounting form in an inverter circuit according to claim 1, and the chip for switching can respond also to surface mounting.

[0008] As for an inverter circuit according to claim 3, in an inverter circuit according to claim 1, four terminals are pin terminals and the chip for switching can respond also to the usual mounting by four pin terminals.

[0009] The compact self-ballasted fluorescent lamp according to claim 4 possesses claim 1 which makes a discharge lamp and; discharge lamp turn on thru/or covering with which the inverter circuit was held while supporting the inverter circuit and; discharge lamp of a publication 3 either, and the mouthpiece attached in; covering, and since the component-side product is narrow, it can attain a miniaturization more.

[0010]

[Embodiment of the Invention] Hereafter, the compact self-ballasted fluorescent lamp of this invention and the gestalt of

1 operation of lighting fitting are explained with reference to a drawing.

[0011] Drawing 2 is the side elevation in which turning off some compact self-ballasted fluorescent lamps, and lacking and showing it, as shown in drawing 2, 11 is a compact self-ballasted fluorescent lamp, and this compact self-ballasted fluorescent lamp 11 is equipped with the arc tube 18 as the covering 14 which has a mouthpiece 12, the lighting circuit 16 contained by this covering 14, the globe 17 which has translucency, and a discharge lamp contained by this globe 17. And the envelope which consists of a mouthpiece 12, covering 14, and a globe 17 is formed in the appearance which rated power approximates to the standard size of electric lamps for general lighting, such as an incandescent lamp of for example, 60W type or 100W type. In addition, electric lamps for general lighting are JIS. C It is defined as 7501.

[0012] And covering 14 is equipped with the body 21 of covering formed with heat-resistant synthetic resin, such as polybutylene terephthalate (PBT), etc. The approximate circle tubed which has opening extended caudad is put on the mouthpieces 12, such as E14 type E26 form, by nothing and the upper limit section, and this body 21 of covering is being fixed by adhesives or the caulking.

[0013] Moreover, a globe 17 is the opalescence which has transparence or optical diffusibility, and while being formed with glass or synthetic resin in the shape of [of the bulb of electric lamps for general lighting, such as an incandescent lamp, and an abbreviation same configuration] a smooth surface, the fitting edge which fits in inside lower limit opening of covering 14 and which is not illustrated is formed in the verge-of-opening section. In addition, this globe 17 can combine another members, such as a diffusion shell, and can also improve the homogeneity of brightness, or can also be omitted.

[0014] Moreover, as the lighting circuit 16 is equipped with the circuit board 24 arranged at the shape of level, i.e., the longitudinal direction and perpendicular of an arc tube 18, and shows it to drawing 3, the top face which is both-sides 12, i.e., mouthpiece, side of this circuit board 24 is equipped with the bendable flexible substrate 25, and it is equipped with the lighting circuit 16 shown in the top face and the flexible substrate 25 of the circuit board 24 at drawing 1.

[0015] and in the top face of the circuit board 24, it is comparatively strong with heat, namely, components with comparatively high thermal resistance arrange -- having -- the flexible substrate 25 -- the shape of a chip -- it is comparatively weak with heat, namely, components with comparatively low thermal resistance are arranged. Thus, by estranging from the circuit board 24 to which components are arranged in the flexible substrate 25, and temperature becomes high by generation of heat of an arc tube 18, comparatively, even if it is heat-resistant low components, temperature can be reduced, and it can contain in a compact in covering 14 efficiently using the flexibility of the flexible substrate 25. Especially, in the case of a chip, when the temperature of a solder side rises, a possibility that electrical installation may become unstable can also be prevented.

[0016] In addition, as long as the mounting tooth space of passive circuit elements is enough secured to the circuit board 24, the lighting circuit 16 may be constituted, without forming the flexible substrate 25.

[0017] Moreover, an arc tube 18 has the glass bulb 31, the fluorescent substance layer by which the fluorescent substance was applied to the inside of this glass bulb 31 and which is not illustrated is formed, the filler gas used as the discharge gas containing rare gas, mercury, etc., such as an argon, is enclosed with the interior of the glass bulb 31, and the electrode of the pair which is not illustrated to the both ends of the glass bulb 31 is ****(ed).

[0018] And the glass bulb 31 has the abbreviation isomorphism-like three shells 33a, 33b, and 33c, and these shells 33a-33c are formed in the shape of [glass] cross-section abbreviation for U characters which is approximately cylindrical, curves smoothly in pars intermedia and has a crowning. Moreover, sequential connection is made through the communicating tube section 36 from which the both ends of each shells 33a and 33b of the pars intermedia of the glass bulb 31 and the end of each shells 33b and 33c of the both ends of the glass bulb 31 serve as the bond section, and one continuous discharge way 37 is formed. Furthermore, in the condition that the glass bulb 31 was built into the compact self-ballasted fluorescent lamp 11, the crowning of each shells 33a-33c is located at equal intervals on the predetermined periphery centering on the medial axis which makes a longitudinal direction the vertical direction of a compact self-ballasted fluorescent lamp 11, and each shells 33a-33c are arranged corresponding to each side of a cross-section triangle.

[0019] Moreover, an arc tube 18 is attached in the dashboard 61 as a support means which is a fluorescent lamp holddown member and is a lighting circuit holddown member again, and this dashboard 61 is being fixed to covering 14. That is, a dashboard 61 is equipped with the substrate section 62 which makes disc-like, after inserting the edge of each shells 33a-33c in this substrate section 62, adhesion etc. is carried out with adhesives, and the arc tube 18 is being fixed to the dashboard 61. Moreover, from the periphery section of the substrate section 62, the fitting step 63 which

goes outside further toward a top is formed. And these members of each other are being fixed by fitting in this fitting step 63 inside covering 14, and filling up adhesives with the condition of having fitted in the fitting edge of a globe 17 between this fitting step 63 and covering 14 further, between the fitting step 63 and covering 14. Moreover, the piece section 64 of attachment which makes the shape of a cylinder etc. protrudes, fitting or adhesion is carried out to this piece section 64 of attachment, and the circuit board 24 of the lighting circuit 16 is attached in the fitting step 63 bottom.

[0020] And drawing 1 is a circuit diagram explaining the configuration of a lighting circuit, the capacitor C1 which constitutes a filter through a fuse F1 is connected to the commercial alternating current power source e, and, as for this lighting circuit 16, the input terminal of a full wave rectifier 71 is connected to this capacitor C1 through the inductor L1 which constitutes a filter. Moreover, the capacitor C2 for smooth is connected to the output terminal of this full wave rectifier 71, the input power circuit E is constituted and the inverter main circuit 73 of the inverter circuit 72 of the half bridge form where high frequency is generated is connected to the capacitor C2 of this input power circuit E. In addition, many of components which constitute the input power circuit E are attached in the front face of the circuit board 24.

[0021] Moreover, as for the inverter main circuit 73, the field-effect transistor Q1 as a transistor of the N channel of the MOS form which is a switching element and which becomes complementary mutually, and the field-effect transistor Q2 as a transistor of the P channel of an MOS form are connected to juxtaposition to the capacitor C2 at the serial. The source with mutual field-effect transistor Q1 of an N channel and field-effect transistor Q2 of a P channel is connected. And a field-effect transistor Q1 and a field-effect transistor Q2 As are shown in drawing 4, and it holds in the same package 74 of 4 pin terminals and is shown in drawing 2 and drawing 3 As it is mounted in the front face of the circuit board 24 and is shown in drawing 5, the drain of a field-effect transistor Q1 as a drain terminal D of an N channel (N) As a common source terminal S of the source of a field-effect transistor Q1 and a field-effect transistor Q2 As common gate terminal G of the gate of a field-effect transistor Q1 and a field-effect transistor Q2, the drain of a field-effect transistor Q2 has four terminals as a drain terminal D of a P channel (P).

[0022] furthermore, between the drain of a field-effect transistor Q2, and the source The capacitor C3 and the ballast choke L3 the inductor L2 for resonance and for a direct-current cut are minded. The end of the filament coils 18a and 18b of the both ends of an arc tube 18 is connected, respectively. The capacitor C4 for resonance is connected between the ends of the end of one filament coil 18a, and filament coil 18b of another side, and the capacitor C5 for starting is connected between the other ends of the other end of one filament coil 18a, and filament coil 18b of another side.

[0023] moreover, between the gate of a capacitor C2 and a field-effect transistor Q1, and the gate of a field-effect transistor Q2 The resistance R2 for starting which constitutes a bootstrap circuit 75 is connected. Between the sources of the gate of these field-effect transistors Q1 and the gate of a field-effect transistor Q2, a field-effect transistor Q1, and a field-effect transistor Q2 The series circuit of a capacitor C6 and a capacitor C7 is connected. As opposed to the series circuit of these capacitors C6 and the capacitor C7 of the gate control circuit 76 as a gate control means The series circuit of the zener diode ZD1 for gate protection of a field-effect transistor Q1 and a field-effect transistor Q2 and zener diode ZD2 is connected to juxtaposition. Moreover, a secondary winding L4 joins together magnetically, and is prepared in an inductor L2, and this secondary winding L4 is connected at the node of a capacitor C6 and a capacitor C7. Furthermore, the resistance R3 of a bootstrap circuit 75 is connected to juxtaposition to the capacitor C6.

[0024] Furthermore, between the drain of a field-effect transistor Q2, and the source, the parallel circuit of the resistance R4 of a bootstrap circuit 75 and the capacitor C8 for a switching improvement is connected.

[0025] In addition, the thing of for example, a full bridge form which has two or more pairs of switching elements each other connected in serial is sufficient as the inverter main circuit 73. Furthermore; the thing of the format that the preheating of both filament coils 18a and 18b is not carried out for the thing of the format that the preheating of both filament coils 18a and 18b is carried out, either is sufficient as an arc tube 18.

[0026] And if a power source is supplied to the lighting circuit 16, full wave rectification of the electrical potential difference of the commercial alternating current power source e will be carried out with a full wave rectifier 71, and it will carry out smooth by the capacitor C2.

[0027] First, an electrical potential difference is impressed to the gate of the field-effect transistor Q1 of N channel through resistance R2, and a field-effect transistor Q1 turns on. An electrical potential difference is impressed to close [of an inductor L2, a capacitor C3, the ballast choke L3, a capacitor C4, and a capacitor C5] by ON of a field-effect transistor Q1, and an inductor L2, a capacitor C3, the ballast choke L3, a capacitor C4, and a capacitor C5 resonate. And

induction of the electrical potential difference is carried out to the secondary winding L4 of an inductor L2, and a capacitor C6, a capacitor C7, etc. of the gate control circuit 76 carry out proper resonance, make a field-effect transistor Q1 turn on, and generate the electrical potential difference which makes a field-effect transistor Q2 turn off.

[0028] Subsequently, if the resonance voltage of an inductor L2, a capacitor C3, the ballast choke L3, a capacitor C4, and a capacitor C5 is reversed, in a secondary winding L4, an electrical potential difference contrary to last time will occur, and the gate control circuit 76 makes a field-effect transistor Q1 turn off, and generates the electrical potential difference which makes a field-effect transistor Q2 turn on. Furthermore, if the resonance voltage of an inductor L2, a capacitor C3, the ballast choke L3, a capacitor C4, and a capacitor C5 is reversed, while a field-effect transistor Q1 turns on, a field-effect transistor Q2 turns off. Henceforth, similarly, a field-effect transistor Q1 and a field-effect transistor Q2 turn on and turn off by turns, resonance voltage occurs, the preheating of the filament coils 18a and 18b being carried out, starting voltage is impressed, it starts and the arc tube 18 by which parallel connection was carried out to the capacitor C4 and the capacitor C5 is turned on.

[0029] Moreover, with zener diode ZD1 and zener diode ZD2, while fixed-izing gate voltage of a field-effect transistor Q1 and a field-effect transistor Q2, the gate is protected from the excessive electrical potential difference.

[0030] Therefore, since the field-effect transistor Q1 of an N channel was connected to the high potential side, using the field-effect transistors Q1 and Q2 of an N channel and a P channel, the field-effect transistors Q1 and Q2 of an N channel and a P channel are controllable by one gate control circuit 76.

[0031] While according to the gestalt of the above-mentioned implementation being able to make it 4 pin terminals by containing the field-effect transistors Q1 and Q2 of an N channel and a P channel in the same package 74 and being able to make small occupancy area of the field-effect transistors Q1 and Q2 of the N channel in the circuit board 24, and a P channel, leading about of a circuit can be simplified and it is suitable for the compact self-ballasted fluorescent lamp 11 with which the miniaturization of the circuit board 24 is called for especially.

[0032] Next, the gestalt of other operations is explained with reference to drawing 6.

[0033] Drawing 6 is the explanatory view showing the chip of the surface mounting form of the gestalt of other operations, is replaced with the same package 74 of 4 pin terminals shown in drawing 5, the field-effect transistors Q1 and Q2 of an N channel and a P channel are held in the same package 77 of a surface mounting form, and connection is carried out like the field-effect transistors Q1 and Q2 of the N channel shown in drawing 5, and a P channel.

[0034] Moreover, the gestalt of other operations is explained with reference to drawing 7.

[0035] Drawing 7 is the explanatory view showing a flexible substrate, and the gestalt of operation shown in this drawing 7 sticks an insulation sheet 78 on the front face of the flexible substrate 25 shown in drawing 3.

[0036] Thus, since the electrical part or pattern of the flexible substrate 25 and the circuit board 24 can prevent contacting electrically by sticking an insulation sheet 78 on the front face of the flexible substrate 25, packaging density can be made high. In addition, if an insulation sheet 78 is stuck on both sides of the flexible substrate 25, an insulation can be ensured more.

[0037] Furthermore, the gestalt of other operations is explained with reference to drawing 8.

[0038] Drawing 8 is the explanatory view in which it is shown near the circuit board of the gestalt of other operations, and it is the thing which made the perpendicular substrate 81 of a configuration set by the inside configuration of covering 14 in the shape of [so-called] reverse T character set up perpendicularly according to the diameter direction of the circuit board 24. A pin 82 is specifically projected and formed the lower side of the perpendicular substrate 81, it engages with two or more engagement holes which met in the diameter direction which was formed in the circuit board 24, and which is not illustrated, and this pin 82 is soldered to them. And the tip of the perpendicular substrate 81 is inserted into a mouthpiece 12, and the weak capacitor C1 is mounted in temperature near the mouthpiece 12 which separates from the circuit board 24 most and is considered that temperature is comparatively low. in addition, this mouthpiece -- in the 12 neighborhood, weak IC which has the solid-state-switching component or such solid-state-switching components of an N channel and a P channel, such as field-effect transistors Q1 and Q2, for example may be mounted in temperature.

[0039] Moreover, by locating the filament coils 18a and 18b of an arc tube 18 in the one side of the perpendicular substrate 81 of the circuit board 24 Although the temperature of one side of the perpendicular substrate 81 of the circuit board 24 will become high with heat and radiant heat handed down by the filament coils 18a and 18b etc. Since the circuit board 24 bottom is divided into two rooms by the perpendicular substrate 81 and temperature of the other side of the perpendicular substrate 81 of the circuit board 24 can be made low, the cure against temperature is attained by

mounting heat-resistant weak components in the other side of the perpendicular substrate 81 of the circuit board 24.

[0040] As mentioned above, if the diameter of the circuit board 24 is met, since the longitudinal section of the inside of covering 14 will serve as largest area, area of the perpendicular substrate 81 can be most made large, and a component-side product can be made large.

[0041] since [moreover,] the perpendicular substrate 81 is located to near a mouthpiece 12 -- a mouthpiece with comparatively low temperature -- since the lead wire which floated for a long time does not necessarily need to be taken about even if it arranges an electrical part in the 12 neighborhood, a production process is not complicated, either. Furthermore, by equipping the perpendicular substrate 81 with components, a long lead wire etc. becomes unnecessary and the mechanical load also of a possibility of adding and escaping beyond the need is lost to the plastic surgery before the assembly of lead wire, or lead wire.

[0042] Furthermore, the gestalt of other operations is explained with reference to drawing 9.

[0043] Drawing 9 is the explanatory view showing the relation between the perpendicular substrate of the gestalt of other operations, and a mouthpiece. As shown in drawing 9, the notching 85 which the electrically connectable metal terminal area exposed is formed in a substrate cross section like a through hole near the mouthpiece 12 of the perpendicular substrate 81. The piece 86 of connection of the shape of a spring formed in the interior of a mouthpiece 12 is connected to this notching 85 electrically and mechanically, and a mouthpiece 12 and the perpendicular substrate 81 are connected electrically.

[0044] Thus, electric connection of a mouthpiece 12 and the perpendicular substrate 81 is simply attained by connecting the piece 86 of connection of a mouthpiece 12 to the notching 85 of the perpendicular substrate 81.

[0045] Furthermore, the gestalt of other operations is explained with reference to drawing 10.

[0046] Drawing 10 is the explanatory view showing the relation between the perpendicular substrate of the gestalt of other operations, and a mouthpiece, and it also fixes covering 14 to a mouthpiece 12 and coincidence at coincidence while it forms the contact pins 87 and 88 connected with the perpendicular substrate 81 electrically and mechanically through covering 14 at two places of a mouthpiece 12 and connects a mouthpiece 12 and the perpendicular substrate 81 electrically, as shown in drawing 10.

[0047] Thus, while electric connection of a mouthpiece 12 and the perpendicular substrate 81 is simply attained by connecting a mouthpiece 12 to the perpendicular substrate 81 with contact pins 87 and 88 through covering 14, immobilization of covering 14 can also be performed.

[0048] Moreover, the gestalt of other operations is explained with reference to drawing 11.

[0049] Drawing 11 is the explanatory view showing the relation between the circuit board, a dashboard, and an arc tube, as shown in drawing 11, formed the connector 91 by resin mold etc. at the dashboard 61, and has connected the arc tube 18 to this connector 91 electrically. Moreover, the contact pin 92 corresponding to these connectors 91 is attached in the circuit board 24, and the contact pin 92 of the circuit board 24 is connected to the connector 91 of a dashboard 61.

[0050] Thus, by connecting the contact pin 24 of the circuit board 24 to the connector 91 of a dashboard 61 Although it becomes unnecessary to have wrapped the wire from an arc tube 18 like before at the pin, the dead space which cannot perform mounting which can insert the fixture for wrapping in the perimeter of a pin needed to be prepared conventionally in automatic wrapping and mounting effectiveness fell Since it is only connecting a contact pin 24 to a connector 91, the big tooth space around a contact pin 24 becomes unnecessary, and mounting effectiveness improves. Moreover, although the wire needed to be operated orthopedically etc. on the occasion of automatic wrapping, such plastic surgery becomes unnecessary and a production process simplifies.

[0051]

[Effect of the Invention] Since according to the inverter circuit according to claim 1 it is the field-effect transistor of a complementary, and the gate can be connected in common and either a drain or the source can be connected in common, when it is made the same package, if there are four terminals, connection of each field-effect transistor can be performed, leading about of a circuit can be made brief, and mounting effectiveness can be improved.

[0052] According to the inverter circuit according to claim 2, in addition to an inverter circuit according to claim 1, the chip for switching is a surface mounting form, and can respond also to surface mounting.

[0053] According to the inverter circuit according to claim 3, in addition to an inverter circuit according to claim 1, since four terminals are pin terminals, the chip for switching can respond also to the usual mounting by four pin terminals.

[0054] According to the compact self-ballasted fluorescent lamp according to claim 4, since the component-side product

is narrow, a miniaturization can be attained more.

[Translation done.]

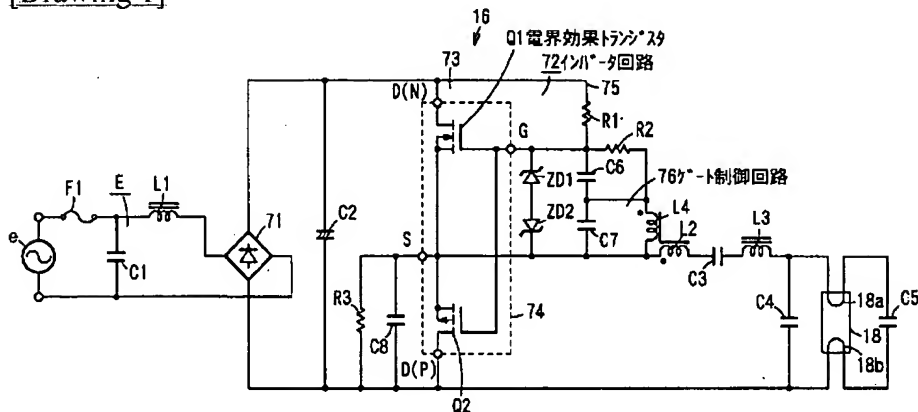
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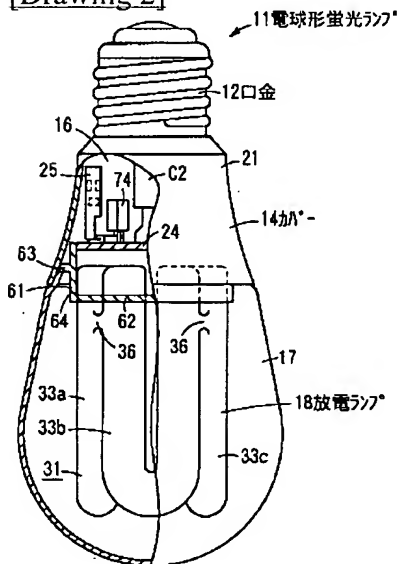
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DRAWINGS

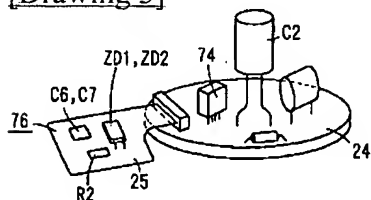
[Drawing 1]



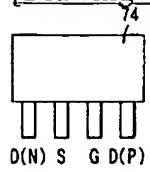
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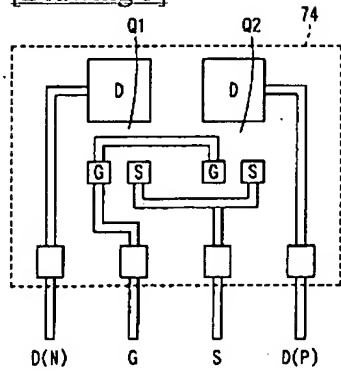
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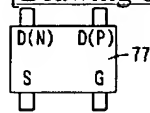
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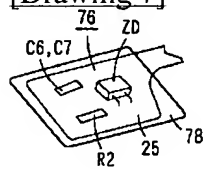
[Drawing 5]



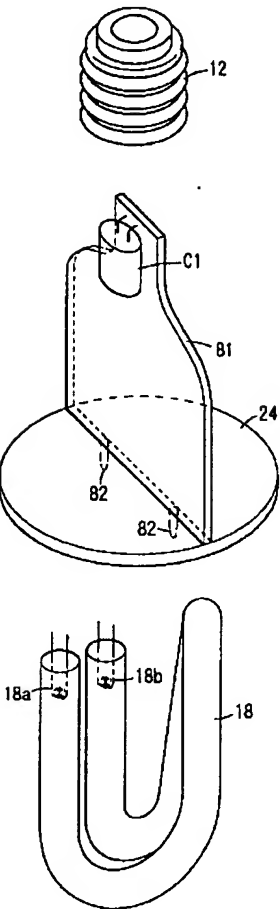
[Drawing 6]



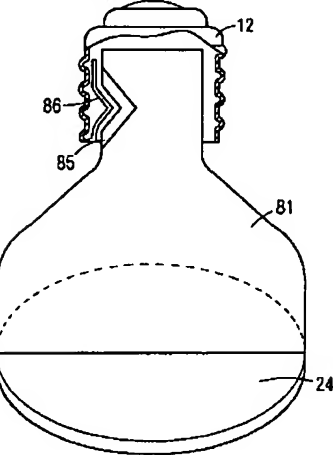
[Drawing 7]



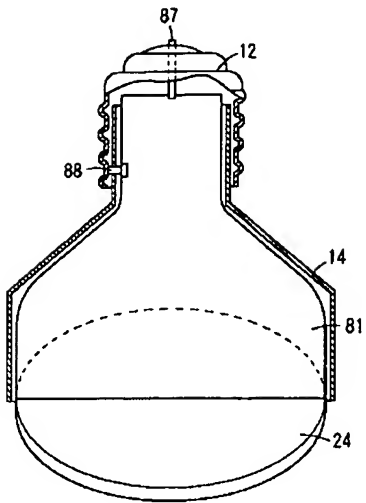
[Drawing 8]



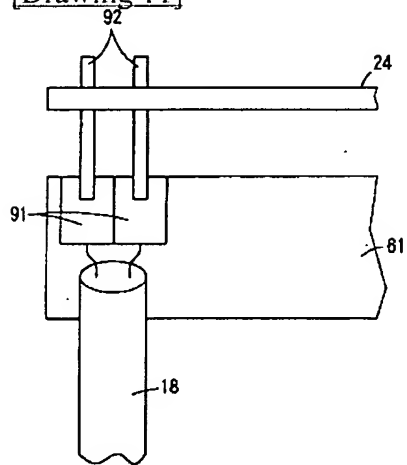
[Drawing 9]



[Drawing 10]



[Drawing 11]



[Translation done.]